DOCUMENT RESUME

ED 346 270 CE 061 279

TITLE Industrial Maintenance Technology. Technical Committee Report.
INSTITUTION Idaho State Dept. of Education, Boise. Div. of Vocational Education.
REPORT NO Vo-Ed-122T
PUB DATE 90
NOTE 18p.; For related documents, see CE 061 277-287.
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Behavioral Objectives; Competence; Competency Based Education; Industrial Personnel; *Job Analysis; *Job Skills; *Machine Repairers; *Maintenance; Manufacturing; Occupational Information; Secondary Education; *Trade and Industrial Education; Troubleshooting; Vocational Education
IDENTIFIERS Idaho

ABSTRACT

This Technical Committee Report prepared by industry representatives in Idaho lists the skills currently necessary for an employee in that state to obtain a job in industrial maintenance technology, retain a job once hired, and advance in that occupational field. (Task lists are grouped according to duty areas generally used in industry settings, and are used as the basis for modules in the statewide curriculum guide development process and for generating student profiles.) The first section of the guide is the task profile, which provides the Idaho code number for the occupation and outlines major concepts/content, laboratory activities, teaching considerations, and intended outcomes. The guide then lists the following 28 tasks with subtasks (competencies) for industrial maintenance technology: employability skills; general safety precautions; blueprints; shop skills; hand tools; portable power tools; stationary shop equipment; troubleshooting; gas welding and cutting; arc welding and cutting; electricity and electronics; elements of mechanics; lubricants; drive components; bearings; pump maintenance and repair; piping systems; hydraulic systems maintenance and repair; troubleshooting hydraulic systems; air compressors; pneumatic systems; industrial pollution control systems; rigging; equipment installation; machine shop turning operations; machine shop milling operations; machine shop job analysis; and maintenance management systems. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED346270

Vo.Ed. 122T

TECHNICAL COMMITTEE REPORT FOR

INDUSTRIAL MAINTENANCE TECHNOLOGY

Invest in Success

IDAHO VTE VOCATIONAL TECHNICAL EDUCATION

STATE DIVISION OF VOCATIONAL EDUCATION

1990

CE 061 279

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

T Andrews

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

Idaho State Board for Vocational Education

Gary G. Fay, President
Twin Falls

Keith Hinckley
Blackfoot

Colleen Mahoney
Lewiston

Roberta L. Fields
New Meadows

M. Karl Shurtliff
Boise

J. Ray Cox
Hayden Lake

Jerry L. Evans
Boise

Trudy Anderson, State Administrator
Division of Vocational Education

It is the official policy of the Division of Vocational Education that no person shall, on the grounds of race, handicap, sex, religion, creed, national origin or age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program, activity, or employment.

INTRODUCTION

The curriculum development process undertaken by the Idaho Division of Vocational Education involves the active use of industry personnel. Industry personnel comprise the sole membership on Technical Committees which are responsible for the development of Task Lists for each program. A Technical Committee Report is prepared on completion of the Committee's assignment. This publication is the Technical Committee Report.

The Task List prepared in the Technical Committee Report reflect the current trends and skills necessary for an employee to: 1) Obtain a job in Idaho's industry, 2) retain a job once hired, and, 3) to advance in the occupational field. Task Lists are grouped according to Duty areas generally used in industry settings. Duty areas are used as the basis for modules in the Statewide Curriculum Guide development process. The Technical Committee segment is the single most significant step in the curriculum development process. All future curriculum activities are predicated on the premise that an accurate picture of industry needs are reflected in the Task List.

Instructional personnel are selected to develop the Statewide Curriculum Guide. These instructors write Performance Objectives for each Task and the subsequent Enabling Objectives for each Performance Objective. The committee members prepare all material in a competency-based format so as to have an effective and efficient methodology for determining student progress. The Statewide Guides are designed as the prime determiner of program content. All programs must follow the established Guide in order to be approved for operation. Any deviation from this Guide requires written approval from the respective program supervisor at the Division of Vocational Education. It is not the intent of the Division that all programs be designed to be exactly the same, but assurance is needed to ensure that the program meets the minimum standards for operation, based on the community needs, equipment, and facilities available to the local school or institution.

The Technical Committee Report does not dictate the level of instruction The Task List developed represents the entire occupational field. Schools and Institutions determine what skills can be taught and what depth of instruction can be provided. They must choose the Tasks to be taught from the Technical Committee Report but are free to determine how many or which ones can be incorporated into their program.

The Technical Committee Report is also used as the primary list for generating Student Profiles. These Profiles are used as a cumulative record of each student's progress. They are printed in a folder format and have levels of performance scales for each Task so that student competence can be recorded for individual skills or tasks. This document will become the main component for Articulation activities in the event that the student desires to go on for additional training or education.

ACKNOWLEDGEMENTS

The Technical Committee process involves personnel from industry who are selected by the Division with assistance from the State Council on Vocational Education. People who serve on the Committees are nominated by local administrators. They generally come from local advisory committees for existing Vocational Education programs or are community representatives in a capacity to provide the necessary information about industry needs. These people serve with the approval of their employers and give their time and energies to the project without cost. The Division provides reimbursement for per diem and travel. We are indebted greatly to these industry representatives and to their employers for the resources so freely given to the pursuit of ensuring that Idaho students receive the most current training and education possible and that which is demanded by industry.

To this end, the Division recognizes the following people who served on the Industrial Maintenance Technical Committee: Carl Hojem, Pinehurst; William H. Sparks, Heyburn; Rich Rabe, Boise; Dex Hendrickson, Rigby; Fred Brown, Lewiston; Larry Ridgeway, Pocatello; David Garcia, Paul, Tom Jefferson, Spokane, Washington.

Your support and assistance was very greatly appreciated. Your patience for enduring the educational process is also noted. The students and instructional staff will be much more able to accomplish their respective goals as a result of your contributions.

Sho Ueda, Supervisor
Trades, Industrial and Technical Education

Don Eshelby
Director of Program Services

CURRICULUM FRAMEWORK PROGRAM AREA: Trade and Industrial

IDAHO DIVISION OF VOCATIONAL EDUCATION REVISION DATE: July, 1989

PROGRAM TITLE: Industrial Maintenance Technology

IDAHO CODE NUMBER: 6109 CIP#: 47.0303

I. MAJOR CONCEPTS/CONTENT: **The purpose of this program is to prepare students for employment as millwrights (638.281-018), maintenance mechanics (629.280-010), machinery erectors (638.261-014), or to provide supplemental training for persons previously or currently employed in these occupations.**

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, welding skills, basic machine shop skills, metal working skills, troubleshooting skills, rigging skills, equipment installation skills, maintenance and repair skills for a variety of systems found in industrial operations including drive components, piping systems, pumps, hydraulic and pneumatic systems, electronic systems, and bearings and seals as well as skills in the set-up and operation of preventive maintenance programs.

II. LABORATORY ACTIVITIES: **Shop or laboratory activities are an integral part of this program and provide instruction in shop practices, rigging, equipment installation, maintenance, troubleshooting and repair of drive systems, pumps, hydraulic and pneumatic systems as well as basic welding and machine shop skills.**

III SPECIAL NOTE: **The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.**

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills, and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work performed.

The typical length of this program for the average-achieving student at the post-secondary level is 1600 hours. The recommended length for secondary programs is 900 hours, with multi period blocks of instruction provided to accomplish a major portion of the listed competencies.

IV. INTENDED OUTCOMES: **After successfully completing this program, the student will be able to:**

01. **Demonstrate employability skills.**
02. **Demonstrate knowledge of general safety precautions.**
03. **Read blueprints.**
04. **Demonstrate shop skills.**
05. **Use and maintain hand tools.**
06. **Use and maintain portable power tools.**
07. **Use stationary shop equipment.**
08. **Demonstrate troubleshooting skills.**
09. **Perform gas welding/cutting.**
10. **Perform arc welding.**
11. **Demonstrate knowledge of electricity & electronics.**
12. **Demonstrate knowledge of the principles of mechanics.**
13. **Demonstrate use and application of lubricants.**
14. **Install and maintain drive components.**
15. **Install, inspect, and repair or replace bearings.**
16. **Perform pump maintenance and repair.**
17. **Maintain piping systems and accessories.**
18. **Maintain and repair hydraulic system components.**
19. **Troubleshoot hydraulic systems.**
20. **Maintain reciprocating and rotary air compressors.**
21. **Troubleshoot pneumatic systems.**
22. **Explain industrial pollution control systems.**
23. **Perform rigging functions.**
24. **Install equipment.**
25. **Perform machine shop turning operations.**
26. **Perform machine shop milling operations.**
27. **Analyze machine shop jobs.**
28. **Demonstrate use of maintenance management systems.**

INSTRUCTIONAL LEVEL CODE

NOTE: **The letter key in the task listing is as follows:**

Level

E **Entry level skill - denotes basic instructional content necessary to enter job market.**

R **Retention level skill - denotes instructional content needed to retain the job**

A **Advanced vocational education level skill - denotes skill training for retention and promotionability.**

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1989

PROGRAM AREA: Trade & Industrial SECONDARY:_____

PROGRAM TITLE:Industrial Maintenance Technology POSTSECONDARY:_____

01.0 DEMONSTRATE EMPLOYABILITY SKILLS

The student will be able to:

Level		
E	01.01	Identify emploment opportunities.
E	01.02	Apply employment-seeking skills.
E	01.03	Interpret employment capabilities.
E	01.04	Demonstrate appropriate work behavior.
E	01.05	Maintain safe and healthy environment.
E	01.06	Maintain a business-like image.
E	01.07	Maintain working relationship with others.
E	01.08	Communicate on the job.
E	01.09	Adapt to change.
E	01.10	Demonstrate a knowledge of business.
E	01.11	Perform mathematical skills.

02.0 DEMONSTRATE KNOWLEDGE OF GENERAL SAFETY PRECAUTIONS

The student will be able to:

Level		
E	02.01	Explain the purpose(s) of the OSHA Act.
E	02.02	Apply shop safety rules and procedures.
E	02.03	Apply personal safety rules and procedures.
E	02.04	Apply electrical safety rules and procedures.
E	02.05	Apply fire safety rules and procedures.
E	02.06	Apply hazardous wastes rules and procedures.
R	02.07	Demonstrate knowledge of emergency evacuation routes, master switch and lockout locations, and the safety color coding system for transport lines.

03.0 READ BLUEPRINTS

The student will be able to:

Level		
E	03.01	Explain the purpose of blueprints.
E	03.02	Examine and interpret machine parts and machine drawings.
E	03.03	Read machine assembly drawings.
R	03.04	Develop sketches.
R	03.05	Compute materials from sheet metal drawings.
R	03.06	Interpret building drawings.
E	03.07	Read and interpret schematics and symbols.
E	03.08	Identify common features and differences of schematics.
E	03.09	Identify electrical wires and connections.
E	03.10	Read electrical diagrams.

E	03.11	**Identify piping systems, projection, joints, valves, and symbols.**
E	03.12	**Read a piping schematic.**
E	03.13	**Identify fluid power system component symbols and interpret diagrams.**
E	03.14	**Interpret air conditioning and refrigeration system and subsystem schematics.**
E	03.15	**Identify symbols for welds.**

04.0 DEMONSTRATE SHOP SKILLS

The student will be able to:

Level		
E	04.01	**Add, subtract, multiply, and divide positive and negative numbers.**
E	04.02	**Add, subtract, multiply, and divide fractions.**
E	04.03	**Change mixed numbers to decimals.**
E	04.04	**Compare numbers and calculate ratios.**
E	04.05	**Demonstrate understanding of geometric functions.**
E	04.06	**Solve algebraic equations.**
E	04.07	**Explain the properties of triangles.**
E	04.08	**Apply trigonometric functions to layout and installation situations.**
E	04.09	**Demonstrate an understanding of metric and linear measurement.**
E	04.10	**Measure bulk materials.**
R	04.11	**Use plumbing codes to determine materials.**
E	04.12	**Explain techniques of measuring motion, forces, fluids, electricity, and temperature.**
E	04.13	**Explain the mechanical and chemical properties of ferrous and non-ferrous metals.**
E	04.14	**Explain industrial manufacturing processes.**
E	04.15	**Explain the industrial use of non-metallic solids, liquids, and gases.**
E	04.16	**Explain the precautions required when using toxic or flammable materials.**
E	04.17	**Demonstrate the use and maintenance of personal protective equipment.**

05.0 USE AND MAINTAIN HAND TOOLS

The student will be able to:

Level		
E	05.01	**Demonstrate the use of rules, tapes, calipers, and micrometers.**
E	05.02	**Demonstrate the use of wrenches and screwdrivers.**
E	05.03	**Demonstrate the use and care of pipefitting tools.**
E	05.04	**Demonstrate the use of line clearing equipment.**
E	05.05	**Demonstrate the use of equipment used to bend and assemble rigid electrical conduit.**
E	05.06	**Demonstrate the use and care of woodworking tools, including saws, planes, drills, hammers, nail sets, and marking gauges.**
E	05.07	**Demonstrate the use and care of sheetmetal tools, including sheet metal gauges, layout tools, dividers, punches, nibblers, riveting tools, metal cutting chisels, metal cutting snips, forming tools, hand seamers, and soldering irons.**
E	05.08	**Demonstrate proper metalworking bench skills, including the use of vices, hacksaws, files, tapes, dies, and reamers.**

E	05.09	**Demonstrate the use and care of ropes, slings, pullers, and block and tackle.**
E	05.10	**Demonstrate the use and care of test and safety equipment.**

06.0 USE AND MAINTAIN PORTABLE POWER TOOLS

The student will be able to:

Level		
E	06.01	**Demonstrate the use and maintenance of light-duty and heavy-duty drills.**
E	06.02	**Demonstrate the use and maintenance of electric hammers.**
E	06.03	**Demonstrate the use and maintenance of pneumatic drills and hammers.**
E	06.04	**Demonstrate the use and maintenance of power screwdrivers and impact wrenches.**
E	06.05	**Demonstrate the use and maintenance of linear motion saws.**
E	06.06	**Demonstrate the use and maintenance of circular saws.**
E	06.07	**Demonstrate the use and maintenance of routers and planes.**
E	06.08	**Demonstrate the use and maintenance of belt, pad and disc sanders.**
E	06.09	**Demonstrate the use and maintenance of grinders and shears.**
A	06.10	**Demonstrate the use and maintenance of explosive actuated tools.**
E	06.11	**Sharpen tools using a bench grinder.**

07.0 USE STATIONARY SHOP EQUIPMENT

The student will be able to:

Level		
E	07.01	**Demonstrate the use of mechanical presses.**
E	07.02	**Demonstrate the use of hydraulic presses.**
E	07.03	**Demonstrate the use of drill presses.**
E	07.04	**Demonstrate the use of bench grinders.**
E	07.05	**Demonstrate the use of power hack saws, cut-off saws or chop saws.**
E	07.06	**Demonstrate the use of band saws.**
E	07.07	**Demonstrate the use of pipe threaders.**
E	07.08	**Demonstrate the use of power metal brakes.**
E	07.09	**Demonstrate the use of power shears.**

08.0 DEMONSTRATE TROUBLESHOOTING SKILLS

The student will be able to:

Level		
E	08.01	**Explain the importance of maintenance.**
E	08.02	**Explain and demonstrate troubleshooting procedures.**
E	08.03	**Identify aids to troubleshooting.**
E	08.04	**Demonstrate a knowledge of the safety rules for troubleshooting and repair procedures.**
R	08.05	**Maintain troubleshooting and repair records.**
E	08.06	**Use manufacturer's manuals, schematics, and troubleshooting charts, as well as general machinery manuals and references.**

09.0 PERFORM GAS WELDING/CUTTING

The student will be able to:

Level		
E	09.01	Identify gas welding and cutting equipment and accessories.
E	09.02	Identify personal protective equipment required for welding and cutting.
E	09.03	Explain capillary attraction as it applies to metal joining.
E	09.04	Demonstrate proper lighting, adjusting, and shutting down of a gas torch.
E	09.05	Layout and cut mild steel.
E	09.06	Braze mild steel.
E	09.07	Braze cast iron.
E	09.08	Solder non-ferrous metals.

10.0 PERFORM ARC WELDING/CUTTING

The student will be able to:

Level		
E	10.01	Identify arc welding equipment and accessories.
E	10.02	Explain the process of shielded metal-arc welding (SMAW).
E	10.03	Explain the process of gas metal-arc welding (GMAW).
E	10.04	Explain the process of gas tungsten-arc welding (GTAW).
E	10.05	Explain and demonstrate the process of carbon arc gouging and cutting.
E	10.06	Demonstrate the use of a mild steel welding rod.
E	10.07	Demonstrate the use of a low hydrogen welding electrode.
E	10.08	Weld stainless steel using the (SMAW) process.
E	10.09	Explain the rationale for preheating and postheating metal.
E	10.10	Weld steel requiring preheat.
E	10.11	Weld cast iron.
E	10.12	Weld aluminum.
E	10.13	Demonstrate (GMAW) welding in the flat, horizontal,and vertical positions.
E	10.14	Demonstrate (GTAW) welding on mild steel, stainless steel, and aluminum.
E	10.15	Demonstrate the process of build up and hard facing.

11.0 DEMONSTRATE KNOWLEDGE OF ELECTRICITY & ELECTRONICS

The student will be able to:

Level		
E	11.01	Define common terms used in electricity and electronics.
E	11.02	Discuss the National Electrical Code.
E	11.03	Explain the nature of static electricity.
E	11.04	Explain methods used to measure and control static electricity.
E	11.05	Explain the theory of magnetism.
E	11.06	Describe the industrial uses of magnets and electromagnets.
E	11.07	Explain the purpose and use of transformers.
E	11.08	Explain Ohm's Law.
E	11.09	Use instruments which measure current, resistance, and potential difference.
E	11.10	Explain the fundamentals of DC circuits.
E	11.11	Explain the use of DC circuits in motors and generators.
E	11.12	Explain the use and function of electrical and electronic control equipment.

E	11.13	**Discuss programmable controllers.**
E	11.14	**Explain the differences between AC and DC circuits.**
E	11.15	**Demonstrate a knowledge of the instruments used to measure electrical circuits.**
E	11.16	**Measure load in three phase circuits.**
E	11.17	**Install electric motors.**
E	11.18	**Demonstrate a knowledge of troubleshooting procedures for electric circuits and control systems.**
E	11.19	**Troubleshoot DC motors.**
E	11.20	**Troubleshoot AC motors.**
E	11.21	**Troubleshoot lighting systems.**

12.0 **DEMONSTRATE A KNOWLEDGE OF THE ELEMENTS OF MECHANICS --**
The student will be able to:

Level		
E	12.01	**Demonstrate an understanding of measuring systems and ratios.**
E	12.02	**Explain working forces of torque, tension, and compression.**
E	12.03	**Explain the laws of motion.**
E	12.04	**Explain how to calculate work.**
E	12.05	**Explain the function of simple machines including levers, inclined plane, wedge wheel and axle, pulley and screw.**
E	12.06	**Explain the types of power and the method of producing power including compound gears.**
E	12.07	**Calculate volume mathematically and by displacement.**
E	12.08	**Explain the laws of friction.**

13.0 **DEMONSTRATE THE USE AND APPLICATION OF LUBRICANTS**
The student will be able to:

Level		
E	13.01	**Explain the function of lubricants.**
E	13.02	**Explain the properties of oil lubricants and factors determining the selection of lubricants.**
E	13.03	**Identify the types and functions of lubricant additives.**
E	13.04	**Describe the types of circulating oils and their purposes.**
R	13.05	**Describe lubricating systems, including the charts and methods used.**
E	13.06	**Demonstrate proper grease application.**
E	13.07	**Demonstrate proper lubricant storage and handling.**
E	13.08	**Lubricate a piece of industrial equipment.**

14.0 **INSTALL AND MAINTAIN DRIVE COMPONENTS**
The student will be able to:

Level		
E	14.01	**Install a solid coupling.**
E	14.02	**Install a jaw coupling.**
E	14.03	**Install a molded rubber coupling.**
E	14.04	**Install a chain type coupling.**

E	14.05	**Identify and install a clutch.**
E	14.06	**Install V-belts and adjust tension.**
E	14.07	**Install and adjust a V-belt and manually adjustable sheaves.**
E	14.08	**Install a V-belt with spring loaded adjustable sheaves.**
E	14.09	**Describe and explain the purposes and advantages of a chain drive system.**
E	14.10	**Explain the function of speed reducers.**
E	14.11	**Explain the function of gears and variable speed reducers.**
E	14.12	**Install and align shafts.**
E	14.13	**Mount drive sprockets and chains.**
E	14.14	**Mount sheaves and pulleys.**
E	14.15	**Mount and align gears on open gear drives.**
E	14.16	**Install a mechanical clutch system.**
E	14.17	**Install adjustable speed drives.**
E	14.18	**Troubleshoot adjustable speed drives.**
E	14.19	**Explain the operation of fluid couplings.**
E	14.20	**Install fluid couplings.**
E	14.21	**Install torque converters.**
E	14.22	**Perform preventive maintenance on drive components.**

15.0 INSTALL, INSPECT, AND REPAIR OR REPLACE BEARINGS

The student will be able to:

Level		
E	15.01	**Identify common bearing types and their advantages.**
E	15.02	**Mount, square, and align antifriction bearings.**
E	15.03	**Identify specialized bearings, their applications and characteristics, including: thrust bearings, self-aligning bearings, non-metallic bearings, and hydrostatic bearings.**
E	15.04	**Identify and select bearing seals for specified applications.**
E	15.05	**List rules for good bearing lubrication.**
E	15.06	**Explain bearing load, wear patterns, & maintenance.**
E	15.07	**Explain the use of cross-reference manuals in bearing maintenance and repair.**
E	15.08	**Explain the use of bearing forecast maintenance systems.**
E	15.09	**Remove, inspect, and replace a plain journal bearing.**

16.0 PERFORM PUMP MAINTENANCE AND REPAIR

The student will be able to:

Level		
R	16.01	**Determine pump capacity and system requirements.**
E	16.02	**Identify packing and seal requirements.**
E	16.03	**Explain the operating principles of centrifugal, propeller and turbine rotary, reciprocating and metering pumps.**
E	16.04	**Disassemble and reassemble a pump.**
E	16.05	**Perform pump maintenance.**

17.0 MAINTAIN PIPING SYSTEMS AND ACCESSORIES

The student will be able to:

Level		
E	17.01	Identify the components of a piping system.
E	17.02	Explain the maintenance features of both metallic and non-metallic piping systems.
E	17.03	Explain valve operation and maintenance.
E	17.04	Explain the use and maintenance of strainers, filters, and traps in piping systems.
E	17.05	Bend and join copper tubing.
E	17.06	Bend and join steel tubing
E	17.07	Join common fittings.
E	17.08	Join metallic pipe.
E	17.09	Join plastic pipe.

18.0 MAINTAIN AND REPAIR HYDRAULIC SYSTEM COMPONENTS

The student will be able to:

Level		
E	18.01	Explain Pascal's Law.
E	18.02	Explain Bernoulli's Principle.
E	18.03	Explain how heat and pressure relate to power and transmission.
E	18.04	Describe the physical and chemical properties of a fluid.
E	18.05	Install and maintain a contaminant removal system.
E	18.06	Explain the operation and use of heat exchangers.
E	18.07	Determine reservoir requirements.
E	18.08	Classify and select pumps for specific applications.
E	18.09	Compute hose requirements.
E	18.10	Install hydraulic lines.
R	18.11	Select and install control valves and servo-type valves.

19.0 TROUBLESHOOT HYDRAULIC SYSTEMS

The student will be able to:

Level		
E	19.01	Read a hydraulic schematic.
E	19.02	Connect electrically controlled valves.
E	19.03	Explain hydraulic system troubleshooting techniques.
E	19.04	Repair and replace hydraulic valves.
E	19.05	Repair and replace hydraulic cylinders.
E	19.06	Repair and replace hydraulic pumps and motors.
E	19.07	Cut, flare, and bend hydraulic tubing.
E	19.08	Install hydraulic components.

20.0 EXPLAIN RECIPROCATING AND ROTARY AIR COMPRESSORS

The student will be able to:

Level		
E	20.01	Explain the relationship of force, weight, mass, and density in a pneumatic system.
E	20.02	Explain the operation of reciprocating compressors.
E	20.03	Explain the operation of rotary compressors.
E	20.04	Explain primary and secondary air treatment.
E	20.05	Explain the operation of compressor valves, cylinders, and motors.

21.0 TROUBLESHOOT PNEUMATIC SYSTEMS

The student will be able to:

Level		
E	21.01	Identify the schematic symbols and diagrams used in pneumatic systems.
E	21.02	Diagram an air supply system.
E	21.03	Install pneumatic system components.
E	21.04	Explain pneumatic system maintenance techniques.
E	21.05	Explain pneumatic system troubleshooting procedures.
E	21.06	Troubleshoot air compressors.
E	21.07	Troubleshoot pneumatic control valves.
E	21.08	Troubleshoot, repair, and install control valves.
E	21.09	Troubleshoot air motors.
E	21.10	Troubleshoot air dryers.

22.0 EXPLAIN THE OPERATION OF INDUSTRIAL POLLUTION CONTROL SYSTEMS

The student will be able to:

Level		
E	22.01	Explain the operation of air pollution control systems.
E	22.02	Explain the operation of water pollution control systems.
E	22.03	Explain the operation of solid waste pollution control systems.
E	22.04	Explain the operation of noise pollution control systems.
E	22.05	Explain the basic philosophy of "right to know" legislation.

23.0 PERFORM RIGGING FUNCTIONS

The student will be able to:

Level		
E	23.01	Estimate the weight of a load.
E	23.02	Find the center of gravity.
E	23.03	Identify the rigging and slings used in maintenance work.
E	23.04	Explain safety inspection procedures for rigging, ropes, and slings.
E	23.05	Identify rope fiber types.
E	23.06	Tie rigging knots, bends, and hitches.
E	23.07	Identify types of wire rope.
E	23.08	Cut and seize wire rope.

E	23.09	**Install wire rope eyes, sockets, and hooks.**
E	23.10	**Identify cranes and hoists.**
E	23.11	**Splice wire rope.**
E	23.12	**Erect a scaffold and install planking.**
E	23.13	**Raise a ladder.**
E	23.14	**Rig lifebelts and life nets.**

24.0 INSTALL EQUIPMENT

The student will be able to:

Level		
E	24.01	**Explain relocation procedures for new equipment in an existing facility.**
E	24.02	**Explain the use of anchors and isolators.**
E	23.03	**Explain procedures for moving and installing new equipment.**
E	24.04	**Explain leveling and aligning procedures.**
E	24.05	**Explain test run guidelines.**
E	24.06	**Explain safety precautions for equipment installation procedures.**
E	24.07	**Explain grouting procedures.**

25.0 PERFORM MACHINE SHOP TURNING OPERATIONS

The student will be able to:

Level		
E	25.01	**Identify the principal parts of an engine lathe.**
E	25.02	**Demonstrate the safe and proper use of lathes and attachments.**
E	25.03	**Perform turning operations.**
E	25.04	**Perform boring operations.**
E	25.05	**Perform drilling and reaming operations.**
E	25.06	**Perform internal and external threading operations.**

26.0 PERFORM MACHINE SHOP MILLING OPERATIONS

The student will be able to:

Level		
E	26.01	**Identify types of milling machines and tooling.**
E	26.02	**Determine spindle speed, feed rates, and direction of feed.**
E	26.03	**Perform external milling operations.**
E	26.04	**Perform angular milling operations.**
E	26.05	**Perform internal milling operations.**
E	26.06	**Slab mill a work piece.**
E	26.07	**Slot on a horizontal milling machine.**
E	26.08	**Mill a keyway.**

27.0 ANALYZE MACHINE SHOP JOBS

The student will be able to:

Level		
E	27.01	**Determine sequence of work on a specified project.**
E	27.02	**Determine tolerances and finishes.**
E	27.03	**Explain the variables that affect job efficiency.**
E	27.04	**Explain the use of the Machinery Handbook.**

28.0 DEMONSTRATE KNOWLEDGE OF MAINTENANCE MANAGEMENT SYSTEMS

The student will be able to:

Level		
E	28.01	**Demonstrate a knowledge of manual record keeping practices.**
E	28.02	**Demonstrate a knowledge of electronic record keeping practices.**
E	28.03	**Complete a work order.**
E	28.04	**Complete an internal requisition.**
E	28.05	**Complete an external requisition.**
E	28.06	**Use a microfiche record system.**
E	28.07	**Define and explain scheduled maintenance.**
E	28.08	**Define and explain planned maintenance.**
E	28.09	**Define and explain breakdown maintenance.**
E	28.10	**Explain the reasons for keeping maintenance records.**
E	28.11	**Explain the reasons for keeping cost records.**
E	28.12	**Demonstrate basic computer literacy.**
E	28.13	**Define statistical process control (SPC).**

Employability skills are a vital component of vocational education programs and should be incorporated into each occupational task list.

IDAHO
VTE
VOCATIONAL TECHNICAL EDUCATION